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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/729,261
Filing Date: December 05, 2003
Appellant(s): RICE ET AL.

Christopher P. Harris
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 01/11/2008 appealing from the Office action mailed 08/21/2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

20020135866	Sasaoka et al.	09-2002
6363087	Rice	03-2002
20030161361	Paldus et al.	08-2003

WO 02/50964 A2, Clarkson, 06-2002

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-5 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaoka et al. (US 2002/0135866) in view of Rice (US 6363087).

With respect to claim 1, Sasaoka teaches an optical fiber ([0011], taught to amplify a plurality of wavelength components) comprising: a core having a longitudinal optical axis (fig.1a #101) and incorporating radially dependent amounts of dopant materials ([0022], creating the refractive index profile seen in fig.1B) to provide a desired refractive index profile and a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes (would inherently allow higher Raman gain along the optical axis and promote lower order modes and discriminate against higher order modes- due to being single mode, and after combination with Rice the prior art fiber would have identical properties to the applicant's fiber), and a cladding region surrounding the core and having a refractive index different from that of the core material (fig.1a #102, fig.1b #151/152), wherein light launched into an end of the fiber is subject to higher Raman gain along the optical axis (due to doping profile), which promotes lower order modes and discriminates against higher order modes. Sasaoka does not teach the fiber to be multimode. Rice teaches a multimode Raman amplifying fiber (abs.) that is formed to allow propagation of lower order modes while discriminating against higher order modes (col.4 lines 20-26). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the fiber of Sasaoka with the core and cladding sizing of Rice (col.4 lines 14-36) in order to allow for increased amplification of the lowest order mode while enabling efficient pumping via multimode pump sources (col.4 lines 32-36).

With respect to claims 2-3, Sasaoka teaches the radially dependent index, gain, and doping profile outlined in claim 1, and additionally teaches the use of a transparent oxide ([0022] GeO2), and the refractive index and Raman gain coefficient have their highest values along the optical axis of the fiber (fig.1B, due to doping profile).

With respect to claim 4, Sasaoka teaches the refractive index profile and Raman gain coefficient profile both have a generally parabolic shape with a peak coinciding with the optical axis of the fiber (fig.1B, due to doping profile).

With respect to claim 5, Sasaoka teaches the dopant concentrations are selected to provide a measure of control over the refractive index profile and the Raman gain coefficient profile (inherent that the doping of the Silicon fiber would adjust the refractive index and Raman gain profile).

With respect to claims 12-13, Sasaoka teaches the optical fiber as defined in claim 1, wherein the doping profile comprises radially dependent amounts of dopant materials comprising a minimum amount of dopant material near an interface between the core and the cladding region with a gradual transition to a maximum amount at the optical axis (fig.1B, inherently providing for higher Raman gain along the optical axis).

Claims 6-9, 11, and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaoka and Rice in view of Clarkson (WO 02/50964 A2).

With respect to claims 6-7, Sasaoka and Rice teach the fiber as outlined in the rejection to claim 1 above, but do not teach a diode laser array providing pump power to

the fiber, means for launching the pump power into the fiber, and reflective means defining a laser cavity. Clarkson teaches a fiber laser system (fig.8a) which includes a diode laser array providing pump power to the fiber (fig.8a #13), means for launching the pump power into the fiber (fig.8a #15), and reflective means defining a laser cavity (fig.8a #50, 55). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the fiber of Sasaoka and Rice with the fiber laser system of Clarkson to pump the fiber gain medium and provide feedback allowing for generation of Raman amplification and oscillation of the laser signal for transmission.

With respect to claims 8-9, Sasaoka, Rice and Clarkson teach the fiber laser as outlined in the rejection to claim 6, and Clarkson additionally teaches a highly reflective mirror at one end (fig.8a #50, pg.19 lines 20-25), and a partially transmitting mirror at the other (fig.8a #55, pg.21 lines 18-21), including outputting an essentially collimated beam to the output mirror (pg.21 lines 3-5). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the fiber laser of Sasaoka, Rice and Clarkson with the mirror reflectivities and lenses of Clarkson in order to allow for the oscillation of a given percentage of the light input into the fiber, to make use of the gain medium, as is well known in the art, as well as to properly spatially position the beam for coupling to any additional optics.

The method of claim 11 is rejected as being taught by Sasaoka, Rice and Clarkson as outlined in the rejection to claim 6.

With respect to claims 14-17, Sasaoka, Rice and Clarkson teach the fiber laser and method as outlined in the rejection to claims 6 and 11, wherein Sasaoka teaches a

multimode input ([0011]), and the doping profile comprises radially dependent amounts of dopant materials comprising a minimum amount of dopant material near an interface between the core and the cladding region with a gradual transition to a maximum amount at the optical axis (fig.1B, inherently providing for higher Raman gain along the optical axis).

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaoka, Rice, Clarkson, and further in view of Paldus et al. (US 2003/0161361).

With respect to claim 10, Sasaoka, Rice and Clarkson teach the fiber laser system as outlined in the rejection to claim 6, including the use of multiple lenses (Clarkson, pg.21 lines 6-7), but do not teach the use of a pinhole filter. Paldus teaches a laser system using a pinhole filter ([0071]). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser system of Sasaoka, Rice and Clarkson with the filter of Paldus in order to utilizing a bandpass method to spatially filter the output light.

(10) Response to Argument

1. 35 U.S.C. 103(a) rejection of claims 1-5, 12, and 13 as being unpatentable over Sasaoka in view of Rice.

The Appellant has made note of KSR v. Teleflex as it pertains to 35 U.S.C. 103(a) rejections.

The Examiner makes light of the fact that the secondary reference to Rice stated direct motivation for the detailed combination, therefor making this obviousness rejection not of the KSR type. Therefor the statement in view of KSR v. Teleflex is moot.

i. The combination of Sasaoka and Rice does not teach or suggest the recitations of claim 1.

Firstly the Examiner will describe figure 1b of Sasaoka.

Figure 1b describes the refractive index profile of both the core (2a) and cladding (2b). The refractive index of the fiber is a function of the base fiber material, silica glass ([0022]), and the added dopants, GeO2 (core-[0022]). This dependence is also noted in [0022]. As the cross section of the fiber shown in fig.1a is described in fig.1b, it is obvious that the refractive index, and thus the dopant profile, is radially dependent. If the GeO2 were not radially doped the parabolic trend seen in the refractive index profile of the core in fig.1b would not exist, and would in fact have a linear shape.

The Examiner now turns to fig.2 and [0006] of the Applicant's specification. Figure 2 outlines a refractive index profile in the core and cladding regions in the fiber of the instant invention. The figure, as well as [0006], also describes how the Raman gain

profile follows the same pattern as the refractive index profile due to the doping profile. Further, [0006] describes using the same GeO2 dopant in the core, and [0015]-[0017] describe the affects of using this dopant in the radially dependent profile. The profile in fig.2 and dopant in [0006] are nearly identical to that taught by Sasaoka.

It is the Examiner's position that the refractive index profile shown in fig.1b and doping described in [0022] of Sasaoka therefor teach the claimed radially dependent dopant profile, which thereby provides the higher Raman gain values along the optical axis of the fiber which promotes lower order modes and discriminates against higher order modes.

The Appellant has argued that Sasaoka does not teach a radially dependant dopant profile which would provide a desired Raman gain coefficient profile that favors lower order modes and is subject to higher Raman gain along the optical axis, which promotes lower order modes and discriminates against higher order modes. The Appellant points towards the G_R/A_{eff} of 0.0005 $(W*m)^{-1}$ taught by Sasaoka and states that this value is dependent only on effective area for a given wavelength of light.

The Examiner agrees that Sasaoka teaches this value at [0026], but notes that this is the minimum value (0.005 or more). If this is only a minimum value at each wavelength for a given area, it does not mean that the value is uniform across the diameter of the fiber. In addition, figure 1b is relied upon to further show the refractive index changes made via the GeO2 doping. This index profile is consistent with radial doping and provides additional evidence to the presence of the claimed Raman gain profile. Both the teaching of the G_R/A_{eff} value and the profile found in figure 1b

demonstrate the necessary occurrence of the Raman gain profile being higher along the optical axis.

The Appellant has further argued that the G_R/A_{eff} value shows a static value for a given area, and that it is logically inconsistent that the value is uniform across the diameter of the fiber. It is further stated that Sasaoka's value varies only as a function of area, not as a function of a specific location of the area.

The Examiner first notes that this argument is believed to be moot as the arguments presented immediately preceding this section describe how the Raman gain profile follows the radially dependent dopant profile. Therefor the claim limitations are met.

As for the argument that Sasaoka teaches the G_R/A_{eff} value to be a function of area, not as a function of a specific location of the area, the Examiner is in general agreement. It is obvious that the G_R/A_{eff} value is a function of the area as it would follow the dopant profile. Secondly, Sasaoka has not specified in detail that the G_R/A_{eff} value is a function of specific area, but this can be seen as inherently present in fig.1b.

The Appellant has argued that a similar G_R/A_{eff} value has been taught by Rice.

The Examiner believes that this point is moot as Rice is not relied on to teach this feature.

The Appellant has argued that the Sasaoka refractive index profile of fig.1b is not consistent with a radially dependent dopant profile and the claimed Raman gain profile.

The Examiner refers to the discussion of Sasaoka's fig.1b above, which addresses the relationship between the index, doping profile, and Raman gain profile.

The Appellant has argued that the doping and refractive index profile of fig.1b of Sasaoka is mischaracterized when viewed in light of the Applicant's specification.

The Examiner again refers to the discussion of Sasaoka's fig.1b above, which addresses the relationship between the index, doping profile, and Raman gain profile, and how these elements are described in the Applicant's specification and figures.

The Appellant has argued that there is no motivation for combining the Sasaoka and Rice prior art pieces.

The Examiner does not agree, and provides the motivating statement used for the combination in the Final rejection:

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the fiber of Sasaoka with the core and cladding sizing of Rice (col.4 lines 14-36) in order to allow for increased amplification of the lowest order mode while enabling efficient pumping via multimode pump sources (col.4 lines 32-36).

The Appellant has argued that it is non-obvious to incorporate a refractive index of a single mode fiber, as taught by Sasaoka, into a multimode fiber, as taught by Rice.

Firstly, the Examiner notes that this point is moot as the combination was made as Sasaoka in view of Rice, not Rice in view of Sasaoka.

For arguments sake, the Examiner points out that the combination of the multimode fiber properties of Rice were motivated to be used with the refractive index profile (dopant profile) of Sasaoka as was discussed immediately preceding this section.

The Examiner also further notes that it was the size of the components of Rice that were motivated to be added to Sasaoka. The size is what allows for the multimode operation of the fiber. The combined index (dopant) profile of Sasaoka with the increased size of Rice for multimode operation correctly reads on the limitations of claim 1.

The Appellant has made note of KSR v. Teleflex as it pertains to 35 U.S.C. 103(a) rejections.

The Examiner makes light of the fact that the secondary reference to Rice stated direct motivation for the detailed combination, therefor making this obviousness rejection not of the KSR type. Therefor the statement in view of KSR v. Teleflex is moot.

ii. The combination of Sasaoka and Rice does not teach or suggest the recitations of claims 2-5.

The Appellant has largely recited the argument outlined with respect to claim 1 regarding the dopant profile. The Examiner rebuts similarly as above.

iii. The combination of Sasaoka and Rice does not teach or suggest the recitations of claim 5.

Firstly the Examiner points out that claim 5 depends from claim 2, not from claim 1 as is stated on page 22 of the Appeal Brief.

The Appellant has argued that as claim 2 was rejected using one dopant material, claim 5 cannot be similarly rejected as it states "…wherein dopant concentrations are selected to provide a measure of independent control over the refractive index profile and the Raman gain profile."

The Examiner does not agree. Claim 5 was interpreted as being met by the teachings of Sasaoka in that only the dopant profile is used to control both the refractive index and the Raman gain profile. As only the dopant profile is used to direct these two items it is believed to be a reasonable interpretation that the dopant profile is acting as an independent control.

iv. The combination of Sasaoka and Rice does not teach or suggest the recitations of claims 12 and 13.

The Appellant has largely recited the argument outlined with respect to claim 1 regarding the dopant profile. The Examiner rebuts similarly as above.

2. 35 U.S.C. 103(a) rejection of claims 6-9, 11, and 14-17 as being unpatentable over Sasaoka in view of Rice, and further in view of Clarkson.

The Appellant has made note of KSR v. Teleflex as it pertains to 35 U.S.C. 103(a) rejections.

The Examiner makes light of the fact that the secondary reference to Clarkson outlined motivation for the detailed combination, therefor making this obviousness rejection not of the KSR type. Therefor the statement in view of KSR v. Teleflex is moot.

i. The combination of Sasaoka, Rice, and Clarkson does not teach or suggest the recitations of claim 6.

The Appellant has largely recited the argument outlined with respect to claim 1 regarding the dopant profile. The Examiner rebuts similarly as above.

ii. The combination of Sasaoka, Rice, and Clarkson does not teach or suggest the recitations of claims 7-9.

The Appellant has largely recited the argument outlined with respect to claim 1 regarding the dopant profile. The Examiner rebuts similarly as above.

iii. The combination of Sasaoka, Rice, and Clarkson does not teach or suggest the recitations of claim 11.

The Appellant has largely recited the argument outlined with respect to claim 1 regarding the dopant profile. The Examiner rebuts similarly as above.

iv. The combination of Sasaoka, Rice, and Clarkson does not teach or suggest the recitations of claims 14 and 15.

The Appellant has largely recited the argument outlined with respect to claim 1 regarding the dopant profile. The Examiner rebuts similarly as above, again noting the description of fig.1b of Sasaoka.

v. The combination of Sasaoka, Rice, and Clarkson does not teach or suggest the recitations of claims 16 and 17.

The Appellant has largely recited the argument outlined with respect to claim 1 regarding the dopant profile. The Examiner rebuts similarly as above.

3. 35 U.S.C. 103(a) rejection of claim 3 as being unpatentable over Sasaoka in view of Rice, and further in view of Clarkson and Paldus.

The Appellant has made note of KSR v. Teleflex as it pertains to 35 U.S.C. 103(a) rejections.

The Examiner makes light of the fact that the secondary reference to Paldus outlined motivation for the detailed combination, therefor making this obviousness rejection not of the KSR type. Therefor the statement in view of KSR v. Teleflex is moot.

i. The combination of Sasaoka, Rice, Clarkson, and Paldus does not teach or suggest the recitations of claim 3.

The Appellant has largely recited the argument outlined with respect to claim 1 regarding the dopant profile. The Examiner rebuts similarly as above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Tod T Van Roy/

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